Pragmatic effect of Blood Flow Restriction Training in students experiencing Restless-Leg-Syndrome with sleep deprivation: A Pilot Study

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ABSTRACT

Introduction: Restless-Leg-Syndrome (RLS), a neurological insult that leads to various involuntary movements in the leg. Sleep deprivation, the commonest symptom of RLS and is experienced in students. Physiotherapeutic interventions have been useful in alleviating the symptoms of RLS but there were negligible studies showing the effect of BFRT on it. This study majorly focuses on the impact of BFRT amongst students with RLS those who are experiencing sleep deprivation.

Methods/ Procedure: A total number of 12 students with RLS along with sleep deprivation were included in this study. The subjects were elected on the basis of convenient sampling method. A self – structured protocol was given for 4 weeks in which the affected leg was wrapped with the Floss-band and the students were informed to perform thigh & calf muscles strengthening along with it. The outcome measures were used to document the scores of RLS & sleep among these students.

Results: The p value of both symptoms of RLS & sleep quality were <0.001 which proves it to be highly significant. The results of symptoms in RLS were documented with the help of RLS Rating Scale and the sleep quality was expressed with the help of Pittsburgh Sleep Quality Index.

Conclusion: This study concluded that BFRT shows an optimistic impact on relieving the symptoms of RLS & sleep quality of students with RLS, it also helped in increasing the strength and tone of thigh & calf musculature and improved the peripheral circulation.

Keywords: Restless Leg Syndrome (RLS), Blood Flow Restriction Training (BFRT), Sleep Quality

INTRODUCTION

Restless-Leg-Syndrome (RLS), a neurological insult that typically hinders the lower limbs, presenting atypical involuntary movements in the leg which are mainly experienced in the evening and can be experienced in the day time as well in certain cases.[1] The cardinal features of RLS are involuntary, rhythmic or periodic movements in the lower limbs at times accompanied with burning or tingling sensations more severely experienced in the evenings.[2] There are two types of RLS, primary in which the symptoms of RLS are caused due to genetic history and on the contrary, in secondary, any neurological deficit, side-effects of any pharmacological drug, metabolic imbalance in the body and during the gestational period are the reasons to cause RLS. [1] Sleep is the majorly affected function in the victims of RLS, as its more active during the nocturnal hours and causes day-time drowsiness.[3] RLS also shows its pessimistic effects on the mental health as well by eliciting stress and makes the individual anxious.[4] RLS is more common in females than in males and is majorly seen in adolescents due to their growing age with mental & social changes.[5] There are evidences which suggest various pharmacological drugs such as iron (Fe) supplements, anti-epileptics and dopaminergic drugs can reduce the symptoms of RLS but on the contrary, these medications can be hazardous on an individual's mental and physical health.[6] Therefore, there is a need of such an evidence which can regress the symptoms of RLS and also show significant improvement in the sleep quality.

Blood Flow Restriction Training (BFRT), a novel physiotherapeutic approach used commonly in managing musculoskeletal impairments in the athletes as it rejuvenates the impaired functions faster.[7] Many evidences show optimum results of BFRT on muscle strength and endurance as it causes muscular hypertrophy. [8] The application of BFRT can be done by intensifying low-load BFRT (LL-BFRT) & high-load BFRT (HL-BFRT) with the help of a tourniquet/ cuff or floss band. [9] This technique causes occlusion of the blood leading to deprivation in the oxygen supply to the muscles and eventually causing hypertrophy in the musculature and it signifies remarkable tonal changes in the distal and proximal muscle along with the target muscle as the body is made of a kinematic chain.[10]

The main motive of this study is to find the effect of Blood Flow Restriction Training in students those who are a shear victim of Restless-Leg-Syndrome and have a disturbed sleep pattern.

MATERIALS & METHODS

Methodology:

- **Study Type:** Experimental Study
- **Study Design:** Pilot Study (Pre & Post)
- **Sampling Method:** Convenient Sampling

- **Sample Size:** 12 students
- **Study Duration:** 4 weeks

Inclusion Criteria:

- Students (college going) between age group – 18 to 22 years both males & females.
- Students with **severe** & **very severe** rating on RLS scale.
- Students with disturbed sleep i.e., scores **>10** on PSQI.

Exclusion Criteria:

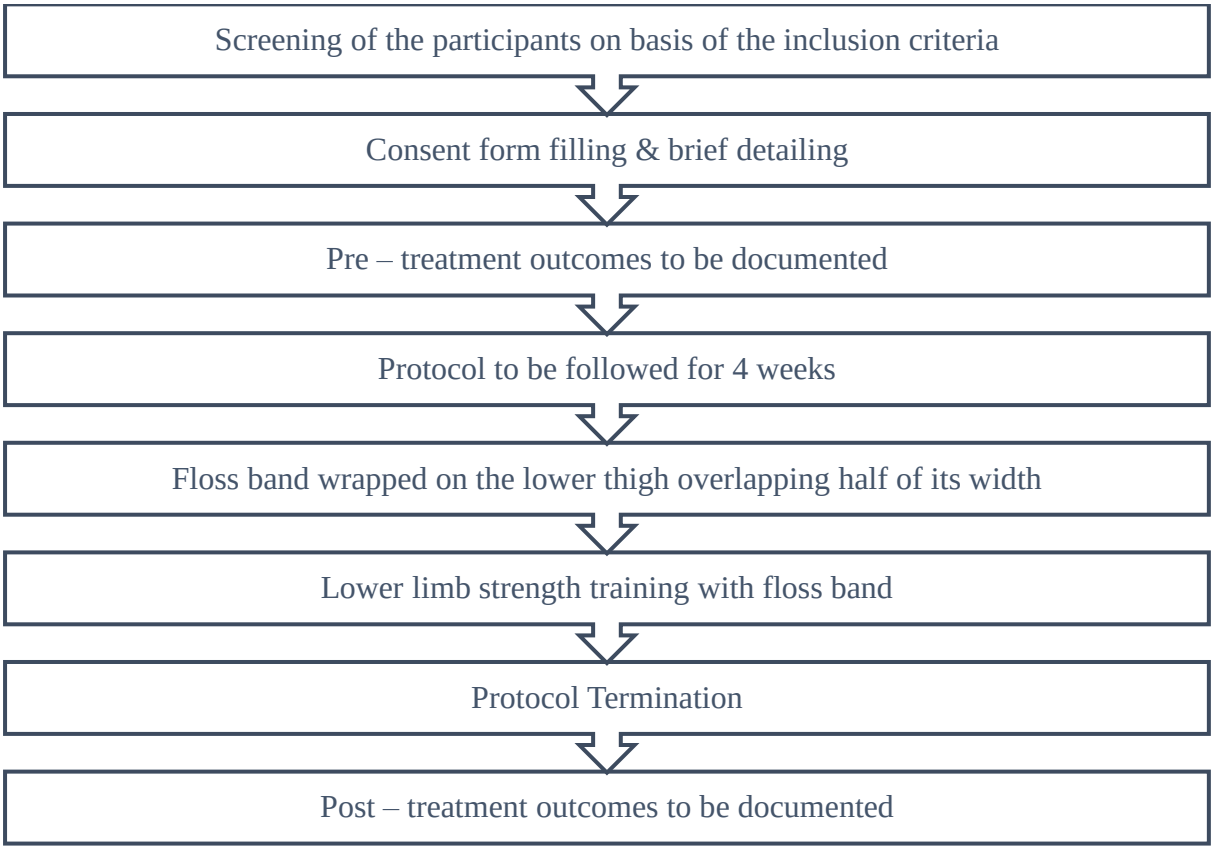
- Students with any injury or wounds in the legs.
- Students pursuing prescribed sleeping medications.
- Students with any vascular co-morbidities.

Materials used:

- Consent Form
- Floss Band
- Restless-Leg-Syndrome Rating Scale (RLS-RS) & Pittsburgh Sleep Quality Index (PSQI)

PROCEDURE

A total number of 12 students were included in this study according to the above-mentioned selection criteria. All the students were firstly instructed to fill the consent forms subjecting their active participation in this study. Pre – treatment outcomes were documented with the help of RLS Rating Scale & PSQI. A self-structured physiotherapeutic protocol was generated that was combined with Blood Flow Restriction Training. The application of floss band for BFRT was done over the lower thigh with intensity signifying 50% pressure of the previous wrap overlapping half of its width. The protocol was followed for 4 weeks. After the termination of the protocol, post – treatment outcomes were documented using the same outcome measures. The selected data was then analyzed statistically and the results were taken out.



Flowchart 1: Procedure

PROTOCOL

Protocol	Frequency	Intensity	Time	Type
Straight Leg Raises with holds	5 days/ week for 4 weeks	15 repetitions with 3 sets	10 – 15 sec holds	Strength training
Squats with holds		10 repetitions with 3 sets	5 – 8 sec holds	
Lunges		10 repetitions with 3 sets	5 – 8 sec holds	
Calf raises		15 repetitions with 3 sets	10 – 15 sec holds	

Table 1: Self – Structured protocol given with BFRT

Figure 1: Straight Leg Raise (SLR)

Figure 2: Squats

Figure 3: Lunges

Figure 4: Calf Raises

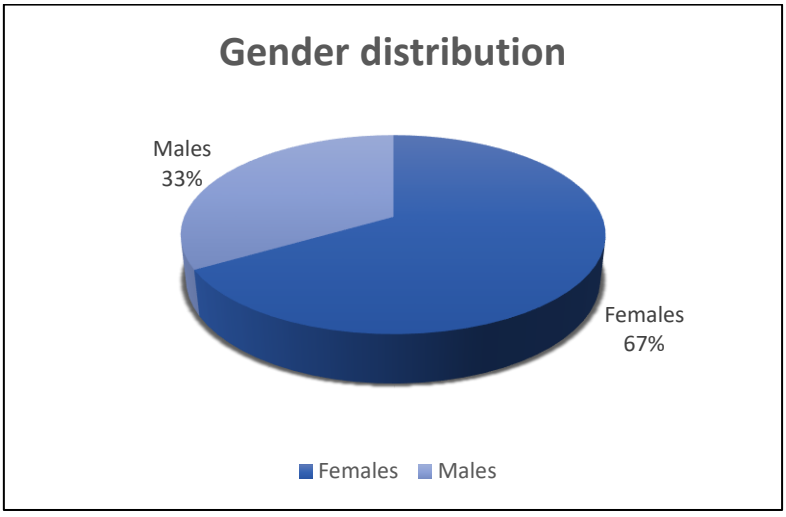
RESULTS

After the data analysis, it was observed that out of 12 students 8 were females & 4 were males. The Pre & post outcomes of RLS and sleep quality were documented using the outcome measures used in this study.

- The percentage of females (67%) were more in this study in comparison to males (33%).

Gender	Number of students	Percentage
Females	8	66.66%
Males	4	33.33%

Table 2: Gender Distribution



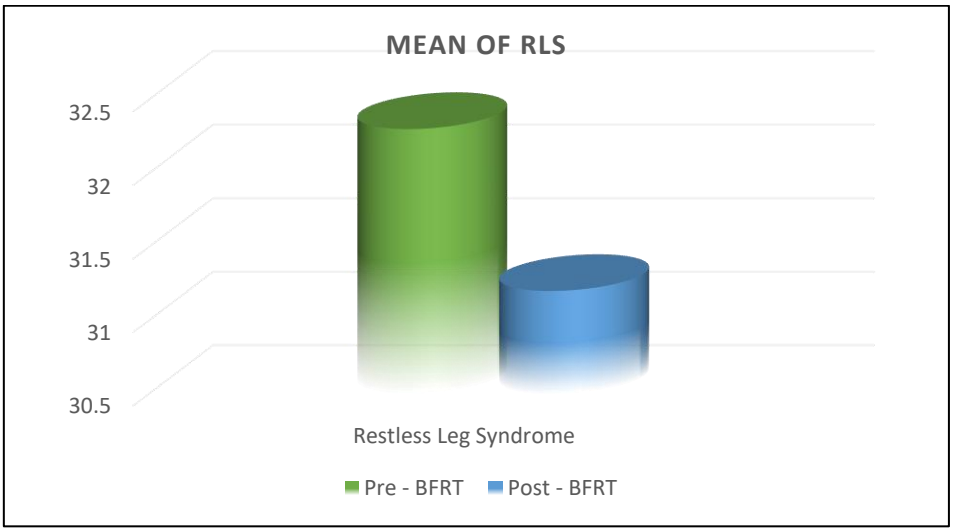
Graph 1: Gender Distribution in percentage

- The scores of RLS were documented on the basis of RLS-RS, paired 't' test was done comparing two variables that's the pre and post scores. The variables of mean and

standard deviation of RLS were pre – BFRT (32.27 ± 4.9) and post – BFRT (31.18 ± 4.4). The p – value (0.0004) is <0.001, proves it to be **HIGHLY SIGNIFICANT**.

RESTING LEG SYNDROME				
Variables	**PRE – BFRT**	**POST -BFRT**	**P – value**	**Result**
Mean ± SD	32.27 ± 4.9	31.18 ± 4.4	0.0004	Highly Significant

Table 3: Mean, SD & P – value of RLS

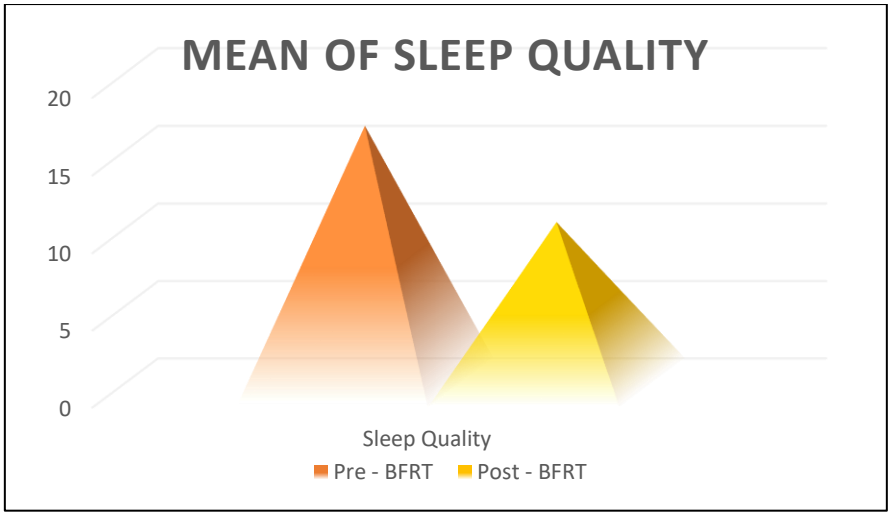


Graph 2: Mean of Pre & Post BFRT with significant difference in the RLS – RS

- The sleep quality was documented with the help of PSQI, paired 't' test was done by the statistician comparing the variables that's the pre & post scores. The variables of mean & standard deviation of sleep quality were pre – BFRT (16.5 ± 2.2) and post – BFRT (10.4 ± 2.3). The p – value (0.0001) is <0.001, hence proves it to be **HIGHLY SIGNIFICANT.**

SLEEP QUALITY				
Variables	**PRE – BFRT**	**POST – BFRT**	**P value**	**Result**
Mean ± SD	16.5 ± 2.2	10.4 ± 2.3	0.0001	Highly Significant

Table 4: Mean, SD & P – value of Sleep Quality



Graph 3: Mean of pre & post BFRT showing significant difference in the sleep quality

DISCUSSION

There are negligible evidences showing any effect of BFRT in students with RLS experiencing sleep deprivation, current study majorly focuses on the above- mentioned hypothesis. This study included students as a focused population as there were previous evidences showing that students are the most common victims of RLS and also experience sleep disturbances. [11] This study included 12 students out of which 8 were females and 4 were males therefore, current study supports published evidence stating that the prevalence of RLS is more commonly seen in females than in males.[12]

Many physiotherapeutic approaches have been proven effective in managing and deceasing the symptoms of RLS. **Salwa R. El-Gendy et al**, conducted a study in which evaluation of flexibility, resistance and aerobic training was performed and showed optimistic impact to relieve the symptoms of RLS.[13] On the contrary, **Scott Jeppson et al**, presented evidence on the impact of hydrotherapy on the symptoms of RLS, the results turned out to be positive and a substantial decrease in RLS was observed.[14] The current study sheerly focused on the students between the age group of 18 – 22 years as they are more prone to experience the symptoms, showed an optimistic effect of BFRT as a novel physiotherapeutic approach for RLS. There was a significant decrement in the symptoms of RLS and the abnormal sensations felt in the victim leg. Just like **S Jenifer Augustina et al**, carried an experimental study focusing on the effect of Transcutaneous Electrical Nerve Stimulation (TENS) with Stretching in gestational women experiencing RLS, showed drastic improvement in the unbearable abnormal sensations.[15] This study did not focus on the body type as in a previous evidence **Waqas Haider et al**, proved that TENS and stretching were effective in curing the severity of RLS in obese.[16]

Restless-Leg-Syndrome is a neurological insult, irrespective of the fact that the symptoms are more musculoskeletal, **Peter C. Douris et al**, concluded that the application of BFRT was seen effective in relieving the symptoms of RLS in individuals with Parkinson Disease (PD) and also helps in improving the strength & tone of the skeletal tissue.[17] The current study was also aiming on RLS in students post application of BFRT and eventually showed significant

improvement in the symptoms of RLS. BFRT is a physical approach which eventually leads to secretion of dopamine & endorphins just like any other physical activity and at the end causes fatigue and tiredness, sleep, **Alvaro Jesús Reina-Ruiz et al**, proved that BFRT improves quality of life and induces sleep quality in patients with Neuro-muscular impairments.[18] In this study as well sleep quality was elicited post – BFRT and a remarkable change was observed pre and post -BFRT. This study also inspected the thigh & calf muscle hypertrophy with respect to blood pooling technique. **Annie Allison Bane et al**, presented a study in Parkinson's disease which showed that the application of BFRT improved the peripheral circulation leading to hypertrophy.[19] All the above evidences were in support with our study, we can say that the hypothesis was proved positive and is a novel search for conditions like RLS.

CONCLUSION

This study concluded that Blood Flow Restriction Training with a floss band is effective in curing the symptoms of Restless-Leg-Syndrome in students also it improves the sleep quality, increases the strength along with the tone of the thigh & calf musculature by and lastly, increases the peripheral circulation as the occluded blood when released, a strong circulatory gush is emphasised in the peripheries.

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